REMARKS

No new matter is added by this amendment. The present application was filed on September 9, 2000 with original claims 1-9. By this amendment, new claim 10 has been added. The claims remaining in consideration are claims 1-10. Reconsideration is respectfully requested.

Claims 1-4 and 6-9 were rejected under 35 USC §103(a) as being unpatentable over US Patent 5,796,617 issued August 18, 1998 to James A. St. Ville ("St. Ville") in view is US Patent 6,295,513 issued September 25, 2001 to James D. Thackston ("Thackston"). Claims 1 and 8 are independent claims. This rejection is respectfully traversed.

The present invention as set forth in claim 1, sets forth a method for providing a simulation of a welding process using integrated models. The models are interconnected by an interconnection tool to determine stresses and distortions of a material being welded. The method includes the steps of determining a model of a geometry of the material, defining a set of coordinates of elements and nodes of the geometry model for a finite element mesh, and delivering the finite element analysis mesh coordinates to a thermal analysis model. The thermal analysis model includes an analytical solution model and a finite element analysis model. A thermal analysis of the welding process is determined as a function of at least one of the analytical solution model and the finite element analysis model. The analytical solution model provides a thermal history of the welding process for a global distortion analysis. The finite element analysis model provides a thermal history of the welding process for a detailed residual stress analysis. The method also includes the steps of delivering the thermal history of the welding process to a structural analysis model and providing a structural analysis of the welding process as a function of the thermal history.

Independent claim 8 sets forth an apparatus for providing a simulation of a welding process using integrated models. The integrated models are interconnected by an interconnection tool to determine stresses and distortions of a material being welded. The apparatus includes a geometry modeler, a meshing tool, and a thermal analysis model. The geometry modeler determines a model of the geometry of the material. The meshing tool defines a set of coordinates of elements and nodes of the geometry model for a finite

element analysis mesh. The thermal analysis model includes an analytical solution model, a finite element analysis model, and a structural analysis model. The analytical solution model provides a thermal history of the welding process for a global distortion analysis. The finite element analysis model provides a thermal history of the welding process for a detailed residual stress analysis. The structural analysis model provides a structural analysis of the welding process as a function of the thermal history.

In contrast, St. Ville discloses a method and apparatus for manufacturing an object, i.e., a prosthesis, having optimized response characteristics. The object is designed/manufactured using a process detailed in Figure 3. In step 21, the equation governing the object, ***in its intended use***, is defined as $\{f\} = \{k\}\{x\}$. $\{f\}$ represents a field which will be applied to the object during use and $\{x\}$ represents the potential or desired response of the object to $\{f\}$ (see column 6, lines 40-56 and column 7, lines 55-57). "For example, in the case of a prosthetic hip, the field may be the mechanical forces which will be applied to the prosthetic hip after implant in the human body." (Column 8, lines 7-9). Following through with this example, the desired potential or response could include desired displacement in response to these mechanical forces.

In step 24, a finite element analysis is performed on a model geometry of the object (designed in step 22) as function of a set of boundary conditions, including $\{f\}$ and $\{x\}$, to solve the above equation and determine $\{k\}$. $\{k\}$ represents the material properties of the material from which the object is to be manufactured to meet the given boundaries defined by $\{f\}$ and $\{x\}$. The material properties are matched against the properties of known, industrial materials and the manufacturing process is determined.

Contrary to the Examiner's assertions, St. Ville does not disclose a method or apparatus for providing a simulation of a welding process using integrated models to determine stresses and distortions of a material being welded, as required by independent claims 1 and 8, respectively.

Specifically, in the least, St. Ville does not disclose a thermal analysis model which includes an analytical model as required by independent claims 1 and 8. In page 3, lines 2, of the instant application, the Examiner refers to column 6, lines 47-56, of St. Ville, in insisting that this claim limitation is met by St. Ville. The cited text describes the object by the equation: $\{f\} = \{k\}\{x\}$, where $\{f\}$ represents a field which will be

applied to the object ***during use*** (such as force) and {x} represents the potential or desired response of the object to {f}, e.g., deflection. {k} represents the desired material properties to provide the desired response, {x}, to the external field {f}. The Examiner also refers to column 13, lines 33-31 which read:

> The mathematics of the inventive method are valid for other types of manufacturing process other than composites such as the manufacturing of metals, plastics, and ceramics. The inventive method is also valid for manufacturing objects based on their ***desired responses to heat and electric currents.*** In short, the inventive method can be used for any computer controlled manufacturing process, where precision volumetrically controlled manufacturing is desired. (Emphasis added).

As discussed above, the ***desired responses to heat and electric currents*** correspond to {x}, i.e., the desired response of the ***object during its intended use.***

St. Ville does not disclose or teach providing a thermal history of a welding process as required by independent claims 1 and 8.

The Examiner states that St. Ville does not expressly disclose the analytical solution model being adapted to provided a thermal history of the welding process to a structural model and providing a structural analysis of the welding process as a function of the thermal history. The Examiner then points to various "modules" in a larger "Engineering Analysis and Simulation Processing Module 946" in Figure 15 of Thackston. However, it should be noted that each of these models represent "software which is used by design team members during the design and development phase to evaluate a proposed design". Thus, the stress analysis module 1502 is used to perform stress analysis and the thermal analysis processing module 1508 is used to perform thermal analysis. However, Thackston does not teach nor suggest using simulation models to determine stresses and distortions of a material being welded, as required in independent claims 1 and 8.

Since neither St. Ville nor Thackston, singularly or in combination, teach or disclose all of the elements of independent claims 1 and 8, the §103(a) rejection of claims 1 and 8 is improper and applicants respectfully request that it be withdrawn. Claims 2-7 and 9 are ultimately dependent upon either allowable claim 1 or 8. Therefore, for the

reasons set forth above, and based on their own merits, applicants respectfully assert that claims 2-7 and 9 are also allowable over St. Ville and Thackston.

The Examiner indicated that claim 5 contained allowable subject matter. This is noted with appreciation. New independent claim 10 contains the allowable subject matter of claim 5 without unneeded limitations.

All of the Examiner's objections and rejections having been successfully traversed, applicants respectfully assert that the present application is now in condition for allowance. An early notice of allowance is solicited.

Applicant believes that no fees are due, however, if any become required, the Commissioner is hereby authorized to charge any additional fees or credit any overpayments to Deposit Account 08-2789. Further and favorable reconsideration of the outstanding Office Action is hereby requested.

Respectfully submitted

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March 19, 2004
Date

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CERTIFICATE OF MAILING

I hereby certify that this Amendment for United States Patent Application Serial Number 09/667,077 filed September 21, 2000 is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on **March 19, 2004**.

Melissa Dadisman

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